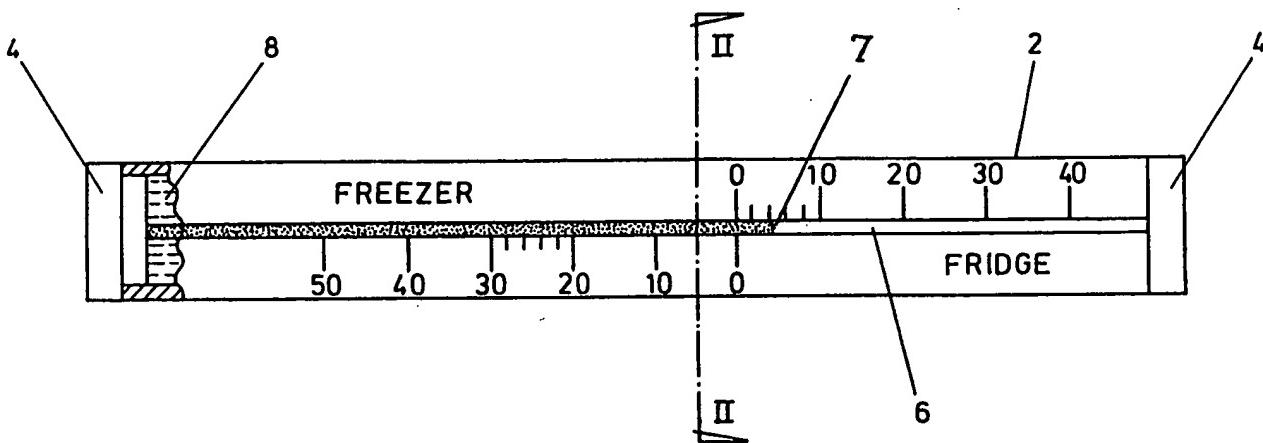




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## (54) Title: TEMPERATURE MEASURING DEVICES



## (57) Abstract

A temperature measuring or indicating device comprises a thermometer and a transparent medium within a transparent capsule, surrounding the thermometer. In use, the medium maintains an indicated temperature of the thermometer for a significant period of time and independently of short term air changes around the device, whereby the device more accurately indicates the temperature of, for example, goods stored in a refrigerator or freezer.

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## TEMPERATURE MEASURING DEVICES

This invention relates to temperature measuring devices and is particularly concerned with a device for use in measuring the temperature of the contents 5 of a refrigerator or freezer.

It is well known to use a thermometer placed in a refrigerator and when it is required to check the temperature of the refrigerator, a user opens the door, takes out the thermometer and reads the 10 temperature.

This method of operation has at least one drawback, ie the thermometer measures the temperature of the air in the refrigerator, and as soon as the door is opened, then the air temperature in the 15 refrigerator rises with the consequent effect on the reading of the thermometer. The air temperature within the refrigerator is also affected by other factors, eg automatic off cycle and electrical defrosting. Further, when the thermometer is removed 20 from the refrigerator to read its temperature measurement the temperature of the air outside the refrigerator causes the thermometer to tend towards reading the temperature of that air. It is obvious then that with the known methods of measuring 25 temperature of the inside of a refrigerator, the temperature measurement reading is not truly related to the temperature of the contents of the refrigerator. Although the air temperature within the refrigerator rises immediately the door is opened, the 30 temperature of the contents of the refrigerator ie the foodstuffs therein, tends to rise very slowly and such a rise is in practice hardly discernible for some time.

An alternative to the above method of measuring 35 the temperature of goods or produce stored in the

refrigerated space in a refrigerator, is to provide a thermometer of the known "probe" type where test probes are caused to pierce the foods and read from there, but this is destructive of the food which cannot then be sold to the consuming public.

An object of the invention is to provide a temperature measuring device providing improvements in relation to one or more of the matters discussed above, or generally.

According to the invention, there is provided a temperature measuring or indicating device, and a corresponding method, as defined in the accompanying claims.

In an embodiment, a temperature measuring or indicating device comprises a thermometer located in intimate contact with a medium capable of retaining a substantially constant temperature for a period of time.

Also in an embodiment, the thermometer is located within a sealed capsule containing such a medium. In the embodiment the capsule is transparent and the medium is a transparent liquid or gel which has a low freezing point. It is envisaged that the thermometer could be of the kind in which an end indicator shows the temperature, whereby it is not necessary for the medium or the capsule to be transparent.

By providing a medium to surround the thermometer or like temperature measuring or indicating device, the medium acting as a heat sink providing thermal inertia to resist rapid temperature fluctuations, the advantage is provided that the measured or indicated temperature at any time is less subject to short term fluctuations, such as occur when a refrigerator or freezer door is opened, or like changes are made in other environments.

The above and other aspects of the invention will

become apparent from the following description which is given by way of example only with reference to the accompanying drawings in which :-

5       Figure 1 is a front elevation of a temperature measuring device according to the invention and Figure 2 is a section on lines II - II of Figure 1.

10      As seen in the drawings a device according to the invention comprises a capsule 2 sealed at its ends by caps 4, and centrally disposed therein is a thermometer 6 graduated towards one end portion with positive temperature measurements, ie in degrees Celsius above freezing point, and towards the other end with negative temperature measurements ie in degrees Celsius below freezing point. Thermometer 6  
15      is of the kind comprising an enclosed volume of liquid which expands and contracts and indicates temperature variation by movement of a meniscus 7 along a capillary tube within the stem of thermometer 6.

20      The capsule 2 is filled with a transparent liquid 8 having a low freezing point, and a high thermal capacity relative to air, and hence a relatively high thermal inertia. An example of such a liquid is ethylene glycol.

25      When the device is in use it is placed in a refrigerator or freezer among the foodstuffs stored therein and the encapsulated liquid adopts the same temperature as those contents. The thermometer thus indicates the temperature of the encapsulated liquid and equally the temperature of the contents of the  
30      refrigerator or freezer.

35      When it is required to ascertain the temperature of the refrigerated foodstuffs, the device is taken out of the fridge where the temperature reading is substantially identical to that of the contents of the refrigerator rather than that of the air temperature within the refrigerator.

In combination, the capsule 2 and the liquid 8 have a slow reaction time to air temperature changes, and so, because the temperature of the encapsulated liquid is held comparatively constant for the short time necessary to read the thermometer, there is almost no change in temperature readings with the thermometer after its removal from the refrigerator. This compares favourably with the normal system of providing a conventional thermometer whose reading starts to rise immediately it is removed from the refrigerator, or when the air temperature therein rises.

Thus it is found that the temperature of the encapsulated liquid in the device of the invention is more nearly the same as that of the foodstuffs and so gives a more accurate indication of the temperature of the refrigerator contents.

Although the example described above refers to the use of the portable encapsulated thermometer device, the same arrangement may be used in conjunction with an alarm system, or with a display outside of the refrigerator, where the reading or displayed temperature more closely relates to that of the foodstuff contents than that of the air within the refrigerator, whereby the otherwise misleading effect of door-opening on the air temperature within a refrigerator or freezer is avoided.

## CLAIMS :-

1 A temperature measuring or indicating device comprising a thermometer, characterised in that the thermometer is located in intimate contact with a medium capable of retaining a substantially constant temperature for a period of time.

2 A temperature measuring or indicating device wherein a heat sink or insulator protects a temperature measuring or indicating device and, in use, serves to maintain, at least for a period of time sufficient for inspection of the measured or indicated temperature, the temperature reached by the temperature or indicating device at a location where the temperature is to be measured or indicated, after removal from that location, or after the ambient temperature has changed.

3 A device according to claim 1 wherein said thermometer is located within a sealed capsule containing said medium.

4 A device according to claim 3 wherein said capsule and said medium are transparent.

5 A device according to claim 4 wherein said thermometer is of the kind in which a liquid meniscus moves lengthwise of a stem of the thermometer.

6 A device as claimed in any one of claims 3 to 5 wherein said capsule is sealed at its ends by caps.

7 A device according to any one of the preceding claims wherein said medium is a transparent liquid or

gel and has a freezing point below the range covered by said device.

8 A device according to claim 7 wherein said  
5 medium comprises ethylene glycol.

9 A refrigerator and/or freezer comprising a temperature measuring device according to any one of the preceding claims.

10 A method of determining the temperature of an article within a refrigerator or freezer comprising providing a device according to any one of claims 1 to 9, locating the device in the refrigerator or freezer for a period of time sufficient for the thermometer or temperature measuring or indicating device to reach  
15 the temperature of an article therein, removing the device from the refrigerator or freezer, or gaining access thereto within the refrigerator or freezer, and determining the indicated temperature while said medium or heat sink maintains the indicated  
20 temperature at the level of said article within the refrigerator or freezer.

11 A method according to claim 10 wherein said temperature measuring or indicating device is connected to a response system, such as an alarm, to alert a user to temperature rise above a pre-determined level.  
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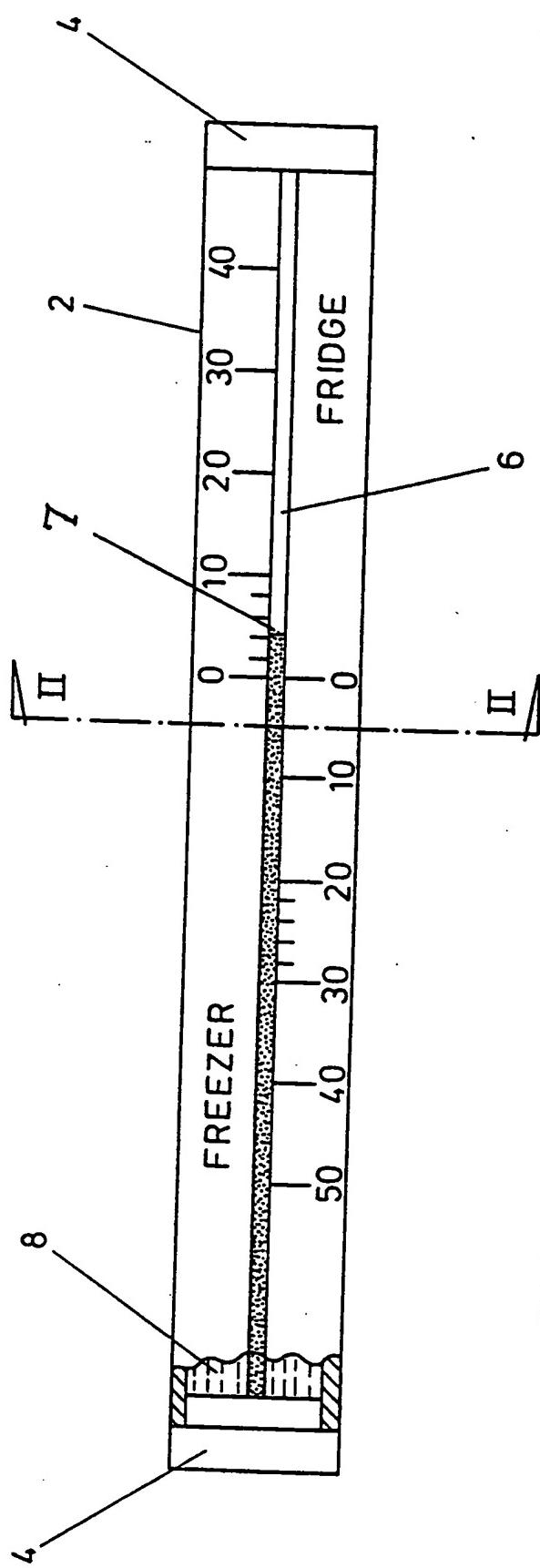


FIG. 1

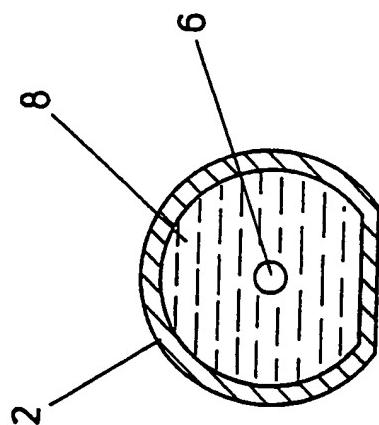


FIG. 2

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 5 G01K1/20 F25D29/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 5 G01K F25D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,30 32 864 (KULEG) 18 March 1982 see page 9, line 20 - page 15, line 22; figures ---	1-3,9-11
X	US,A,5 004 355 (RYAN) 2 April 1991 see column 2, line 47 - column 3, line 7; figures ---	1-11
A	DE,A,28 25 353 (RICHTER & WIESE) 13 December 1979 see page 7 - page 9; figures ---	1,5
A	US,A,2 923 786 (D.R. JONES) 2 February 1960 see column 1, line 54 - line 69; figure 1 -----	1,4,7

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Date of the actual completion of the international search

24 January 1994

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-3032864	18-03-82	NONE	
US-A-5004355	02-04-91	NONE	
DE-A-2825353	13-12-79	NONE	
US-A-2923786		NONE	